It will be seen at once that this is an extension of Poisson's solution of the equation $\frac{du}{dt}=a^2\frac{d^2u}{dx^2}$. There is only one arbitrary function in my solution, and only one in Poisson's, as thus treated. But he has given one with two arbitrary functions, and I believe a similar investigation would apply to my general equations if the equation,

$$\frac{an^{\nu}+bn^{\nu-1}+\ .\ .\ .}{\alpha n^{\mu}+\beta n^{\mu-1}+\ .\ .\ .}=m,$$

were solved with regard to (n), and thus n found in terms of (m).

III. "The Force Function in Crystals." By ALFRED EINHORN, Ph.D. Communicated by G. MATTHEY, F.R.S. Received November 27, 1884.

(Abstract.)

The first part of the paper which appears at present restricts itself to the consideration of the Tesseral, Tetragonal, and Rhombic systems. By means of a well founded assumption in regard to the stress-distribution in crystals of the above systems, the equilibrium conditions are deduced which further involve that the boundary of the configuration must either be plane or spherical.

It also appears that the statical conditions of the agency which causes crystallisation are the same as those so well investigated for gravitation and electricity.

The paper is divided into three chapters. The first chapter treats of the "Foundation of the Assumption." The assumption is that the stress upon any particle can only be transmitted in six direction-lines respectively at right angles in pairs to the three crystallographic axes—it is a consequence of the internal structure which is shown to be analogous to that of an ordinary cannon-ball pile by means of the cleavage properties, the external form and inertia relations of crystals.

The second chapter—"Derivation of the Force Function"—applies the three general differential equilibrium equations of an elastic solid subject to internal forces to the stated stress-distribution. In order to effect this it was necessary to deduce some peculiarities of the force function in a system of uniform density in equilibrium, and subject to internal forces when referred to the three principal axes of inertia through the mass centre. The character of the attracting agency here becomes evident.

The third heading, "Determination of the Boundary." Under this

heading the nature of the boundary is determined, and is shown to be either plane or spherical. And by the application of Green's theorem it also becomes clear that inasmuch as the statical conditions of the crystallising agent are now understood, the force functions derived in the preceding chapter can be independently deduced without aid of the assumption from any one of the primitive forms of the systems under consideration.

IV. "On some Applications of Dynamical Principles to Physical Phenomena." By J. J. THOMSON, M.A., F.R.S., Fellow of Trinity College, and Cavendish Professor of Physics in the University of Cambridge. Received December 16, 1884.

(Abstract.)

In this paper an attempt is made to apply dynamical principles to study some of the phenomena in electricity, magnetism, heat, and elasticity. The matter (including, if necessary, the ether) which takes part in any phenomenon is looked upon as forming a material system, and the motion of this system is investigated by means of general dynamical methods, Lagrange's equations being the method most frequently used. To apply this method, it is necessary to have coordinates which can fix the configuration of the system, so in the first part of the paper coordinates are introduced which fix the configuration of the system, so far as the phenomena we are considering are concerned, *i.e.*, we introduce coordinates which can fix the geometrical, the electrical, the magnetic, the heat, and the strain configuration of the system; we call these, coordinates of the x, y, z, u, and w types respectively. Some of these coordinates only enter the expression for the kinetic energy through their differential coefficients, and may be called gyroscopic coordinates, as such coordinates are of frequent occurrence in problems about gyroscopes.

The terms which involve the x, y, z, u, and w coordinates in the expression for the kinetic energy will be of fifteen different types.

There will be those terms which are quadratic functions of the differential coefficients of the x coordinates, and corresponding terms for the y, z, u, and w coordinates; so that there are in this set terms of five different types, all of which may exist in actual dynamical systems. There are ten types of terms involving the products of differential coefficients of two coordinates of different kinds. These types are considered in order, and it is shown that we have experimental evidence for the existence of only two of them, viz.,